



Administrative Circular

AC/7/2004

2004-02-27

TO ALL NATIONAL COMMITTEES

TO ALL TECHNICAL COMMITTEES AND SUBCOMMITTEES

Dear Sir/Madam,

System approach in IEC standardization

The SMB draws the attention to IEC technical committees and subcommittees to the attached official document entitled "*System Approach in IEC Standardization*".

The SMB at its recent meeting 119, held in Florida, 2004-02-18..19, noted the finalization of this document by an SMB ad hoc Group and set up an SMB task force to report, on an annual basis, on the implementation of the system approach concept. This approach should be part of any training of TC/SC officers through advisory committees and through TC/SC workshops. (*SMB Decision 119/10*).

A definition of the system approach concept is given below:

System approach concept

concept that considers that functional and structural engineering, system-wide interfaces and compositional system properties become more and more important due to the increasing complexity, convergence and interrelationship of technologies.

Note : Consequences of this concept :

As far as IEC is concerned, awareness among IEC TCs/SCs should be created to allow good and coherent cooperation between Products TCs and Systems TCs, taking into account the scope and the responsibilities of each types of TC.

A description of the share of responsibilities is given in the document APS 39 (Version V9, attached to this administrative circular)

TCs/SCs, are requested to take into consideration, as far as possible, the attached document for implementation when preparing standards.

Yours faithfully,

A. AMIT
General Secretary
(authorized by R. Cordelier,
Technical Director)

Annex

System Approach in IEC standardization

V9 final

Foreword

The increasing importance to include system aspects in IEC standardization is a result of changing of the market place. It is necessary to achieve a certain change of culture in the technical (sub-) committees; it will require a longer-term development in the IEC

This document:

- *gives some definitions,*
- *defines the responsibilities and*
- *suggests relationships based on reciprocity*

The key features are reciprocity and support to innovation, by which it is meant that a TC with Product function standardises its products indicating their characteristics; the TC with System function recognises and cross-refers, when applicable, to the product standards. If the standardized characteristics do not fulfil its need, the TC with System function should raise and define the problem and should discuss with the TC with Product function on the need to standardise products having characteristics more appropriate to the system requirements.

The publication of a component standard should not be delayed by the absence of the system standards making use of it, nor should the publication of a system standard be delayed by the absence of relevant component standards.

*The proposal emphasises that each **TC cross-refers to the relevant standards of other TCs and that a TC that cross-refers to standards of another TC sends its drafts to that TC with a request for comment.***

It is a common understanding that:

- *Every committee has to understand that their work is an integral part of a larger system.*
- *The component expertise belongs to the TC standardizing that component.*
- *The system expertise belongs to the TC standardizing Systems.*
- *Both types of TCs must work in good cooperation to **ensure** the proper exchange of information between them to result in appropriate recognition of their respective conclusions.*

A good and fruitful relationship between TCs having Product and System functions can only be established if the different Committees share a similar view of their responsibilities, both in their specific field of expertise and to each other.

Note: It is permissible for a single TC to have both system and product functions

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Definitions

component

constituent part of a device which **cannot be physically divided** into smaller parts without losing its particular function (151-11-21)

By extension:

A constituent part intended to be used as part of another device, product or system

NOTE: A component is a manufactured object, the intrinsic function of which is used to build more complex devices. Example: a capacitor is a device/product; its derivative function on the voltage and its integral function on the current are used as a component to build filters. Other example: a power transformer is a device/product; its function of voltage **conversion** is used as a component to create power distribution networks.

(electrical) device

an assembly of components (utilizing electromagnetic energy) to perform a required function (151-01-01 mod)

Note; A device may be considered as a component of a larger assembly or a product.

device

material element or assembly of such elements intended to perform a required function (151-11-20)

NOTE – A device may form part of a larger device.

apparatus

device or assembly of devices which can be used as an independent unit for specific functions (151-11-22)

NOTE – In English, the term "apparatus" sometimes implies use by skilled persons for professional purposes

product

the result of an engineering and/or manufacturing process, that is intended to be put on the market as an integral unit

NOTE -: A product may be a component, a device, a system or even an "installation". (To note that "installation" is not considered as a product by TC 64, but installation inside an enclosure may be considered as a product by other TCs)

system

set of interrelated elements considered in a defined context as a whole and separated from their environment (IEV 151-11-27)

NOTE 1 – A system is generally defined with the view of achieving a given objective, e.g. by performing a definite function.

NOTE 2 – Elements of a system may be natural or man-made material objects, as well as modes of thinking and the results thereof (e.g. forms of organisation, mathematical methods, programming languages).

NOTE 3 – The system is considered to be separated from the environment and the other external systems by an imaginary surface, which cuts the links between them and the system.

NOTE 4 – The term "system" should be qualified when it is not clear from the context to what it refers, e.g. control system, colorimetric system, system of units, transmission system.

NOTE 5 - The interacting parts of a system may be physically interconnected or with wireless communications or both.

By extension, "element" of the definition given by IEV 151-11-27 includes "component".

Figure 1 depicts the system:

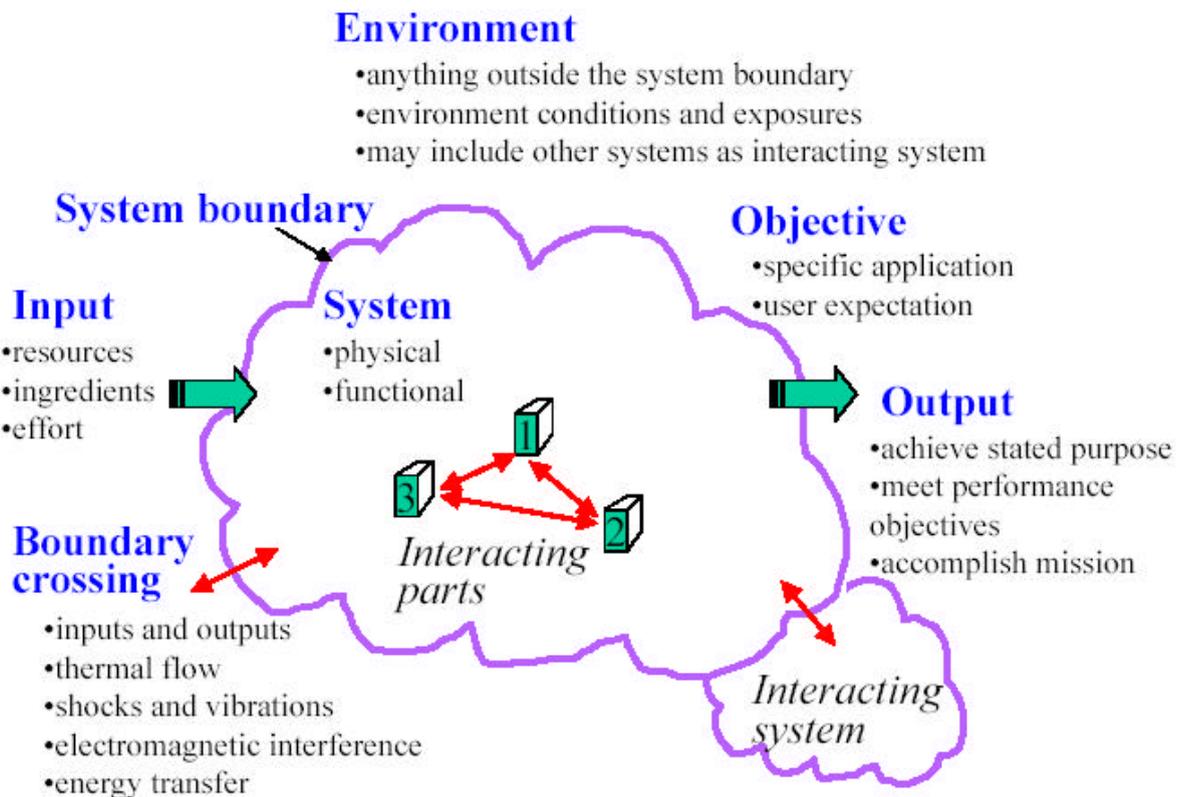


Figure 1 : System and its environment

Note : It is important to note in this figure that certain products need to comply with horizontal standards, but not all products in a system necessarily need to comply with horizontal standards, but would come under the umbrella of the system standards.

horizontal function

treatment of subjects such as fundamental principles, concepts, terminology or technical characteristics, relevant to a number of TCs. (Guide 108)

product function

product aspect such as generic product properties dealing with market oriented aspects

system function

system aspect such as functional and structural engineering, system-wide interfaces, compositional system properties (e.g. system safety/security vs. product/component safety/security)

General statements

Horizontal Functions and System Functions

According to the definitions and taking into account the horizontal function described in Guide 108, Horizontal and System functions should be differentiated

The task of a TC with a **Horizontal function** is to prepare or to revise basic publications dealing with a general topic common to many Products and Systems, such as:

- Fire hazard testing,
- Electromagnetic compatibility,
- Terminology,
- Environmental conditions, classification and methods of test,
- Insulation co-ordination,
- Insulation co-ordination for low-voltage equipment
- Dependability,
- Degrees of protection provided by enclosures,
- Electrical insulation systems,
- Electrostatics
- Etc.

The task of a TC with a **System function** is to write standards dealing with the interrelated use of several **devices/components** within a defined area. Such topics are:

- Low Voltage (LV) Installations
- High Voltage (HV) installations
- Installations on ships,
- Electrical insulation systems,
- Products encompassing several different standardised components, or devices (example power drive systems)
- Electrical equipment and systems for railways,
- Telecommunications networks
- Etc.

Note : According to the definitions, a TC may have both **System Function and Horizontal function**, an example is Electrical insulation systems which is classified in the two categories.

System may be a Product for another Committee having a System function

Example 1

TC 100 deals with "audio, video and multimedia systems and equipment".

- A Television (TV) monitor is an assembly of resistances and capacitors (TC40), transformers (TC96), relays (TC95), HV and LV components, electronic tubes (TC39), connectors (SC48B), printed circuits (TC52), winding wires (TC55), etc.
- A TV monitor may be use in "alarm systems" (TC79), in "electrical equipment in medical practice" (TC62), in "safety of measuring, control and laboratory equipment" (TC66), etc.

Example 2

- An inductor, a cable or a connector are single components. A cable with terminating connectors is a system when considering how it is constituted, it is also a component when considering how it is used for example in a computer system.

Example 3

- A Power Drive System is a system combining a power converter, a control for the converter, a motor, a control for the system, auxiliaries and in some cases transformer(s). It is also a component, as part of a machine (machine tool, lift, rolling mill or whatever).

Example 4

- An optical patchcord is comprised of a length of optical fibre cable that is terminated with connectors. As such, it is a simple system formed of two components. When fabricated, it is sold as an integral unit for use in a telecommunications network. As such, it is a component.

Example 5

- An optical fibre cable is itself a system consisting of one or more optical fibres (e.g. IEC 60793-2-10), strength member and various coverings that is sold as a product (e.g. IEC 60794-2-10) for use in premises cabling systems (e.g. IEC/ISO 11801).

A TC with Product Function may standardise products used by several TCs with System Functions:

- An HV transformer (TC14) may be used by HV installation (TC99), by railways (TC9), etc.
- A LV power cable (TC20) may be used by installation (TC64), by railways (TC9), by household appliances, etc.
- An optical fibre cable may be used in premises cabling (IEC/ISO 11801), or by a Gigabit Ethernet application (IEEE 802.3).

Responsibilities

"TCs with a Product function" are responsible for managing a set of standards dedicated to a defined product or family of products. The scope of the committee helps to clarify, if necessary, the extension of the activity. Some products are only components, however some other products may be considered as a component or as a system depending on who is considering the product. They should take into account the requirements from the different sectors of the market, when deciding on new work and specifying their components.

" TCs with a System Function" are responsible for formulating the minimum performance or functional requirements of a system, and in some cases for the associated components, expressed in terms of the system performance or function. When there is no relevant product standard for a component that is needed in their system to the point that may justify an international component standard the TC with a System Function should address the component committee. Where already available, the product standards shall of course be properly referenced.

TC with System Function

There is a general understanding and agreement on the principle that the TC with a System Function:

- Will specify the overall performance of a system independently of the methods of implementation, but considering that the technology needed is available. In case a system specification provides guidance as how to implement the system, only those requirements should be specified that a particular component or subsystem has to meet when it is used within this system.
- Will refer the relevant product standards that specify components meeting these requirements.
- Will inform the relevant TC with the Product Function when a component standard does not correspond to the system requirements or where the relevant product standard doesn't yet exist, describing the problem or the deficiency.
- Will discuss with the relevant TC with Product Function the preparation of a solution by changes, amendments or new requirements under the responsibility of the TC with Product Function or the TC with System Function.

Concretely, this implies to a TC with System function, a hierarchy of three alternatives for specifying component standards, in decreasing order of preference:

- 1.The committee with system function refers exclusively to publish component standards (or accepted CDVs, accepted internal PASs, or FDISs) of the relevant committee with product function.
- 2.The committee with system function finds no relevant document ("relevant" referring to the list in alternative 1); with its cooperation, the committee with product function quickly publishes a provisional document containing the required specifications. This then proceeds to a published component standard.
- 3.The committee with system function has an even more urgent need, and therefore publishes system functional requirements in its standard, which do not make any reference to a relevant component document because none exists. In parallel, the committee with product function makes **its** best efforts to proceed with standardization including as much as possible the system function requirements. However, in case it fails in satisfying the committee with system function, the committee with the system function and the committee with the product function make their best efforts to develop appropriate requirements, and the committee with system function publishes an amendment referring to revised system requirements or a component/product document as soon as possible.

To increase the likelihood of meeting market expectations and ensure a fair balance of product performance and application capabilities, groups are encouraged to synchronize and plan their activities to achieve a mutually acceptable goal. In particular, alternatives 2 and 3 can only work efficiently if much better synchronization is achieved between committees with system function and product function, e.g. in meeting schedules and publication deadlines.

TC with Product Function

There is a general understanding and agreement on the principle that a TC with Product Function:

- Will characterise the component (or product) independently of all the possible applications, but consider them as much as possible.
- Will refer the relevant system standard, when applicable.
- Will provide information to a TC with System Function describing the situation for a defined application (such as which component(s) fulfil the minimum performance and functional requirements stated by the "TC with a system function" including providing proper reference of the existing product standard).
- In addition, will discuss with the TCs with System Function specifications required by themes in order for the TC with Product Function to establish the necessary requirements to meet the system requirement. This may be done for this application
 - by introducing requirements in the existing product standards or,
 - by creating a suitable class for this component or,
 - by creating a new product standard.

In both cases, where complementary information is needed, a liaison should be established between the two Committees addressing the relevant requirements, to ensure consistency and to avoid duplication; information and studies should be exchanged.

Relationship

The main relationships between systems and components and products are as follow:

- A system is an entity with **delimited and well-defined tasks and effects**.
- A system is described by its **overall performance** and its **interfaces** to the outside, in addition the **system design** may be specified.
- A system consists of **components and subsystems** that provide a contribution to the system function that is determined by the system design. The system design uses the capability of the components, on a more or less optimum way, but does not really determine the behaviour of the individual components.
- The system design specifies the fundamental structure of the system, and the relevant performance and interaction of subsystems.
- A system is separated from its environment through a **cohesive (virtual, complex) surface**.
- A component is an **indivisible entity** in views of the surrounding system.
- A component can be a system as well (sometimes called **subsystem**).

- The Component within a system is described by the **minimum performance** the component needs to contribute and the **component interfaces**
- Standardised Systems may be implemented with help of standardised or not standardised subsystems and components, or a mixture of both, if a relevant TC does not yet cover the components or the subsystems.
- Systems cooperate with other systems via **system interfaces**.
- The set of cooperation relationships between system and subsystems/components constitutes the **system structure**.
- Devices are (sub-)systems/components which perform **specific functions**.
- Products subject to IEC standardization are (sub-)systems/components engineered or produced or offered for covering specific but **manufacturer/vendor independent market/user needs**.

Reciprocity

The normal expectation of TCs with Product function is that their standards will be referred to, wherever relevant, in the system standards without any change, – beyond the range of allowed options (if any).

Reciprocally they can provide, in their standards, examples of system standards where the product may be used. When this is done, it should be clear that the reference is informative.

In addition, the TCs with Product function expect identical classification, designation and coding as well as requirements for their product in standards, which are produced by other committees.

NOTE 1: There has always been a strong request from TCs with Product function that TCs with System function would refer to their product standards when they exist without re-inventing other ones. Moreover, the TCs with System function should not compete against the TCs with Product function and use their work to counteract the decisions of TCs with Product function.

The expectation of TCs with System function is to see their standards referred to, wherever relevant, in the component standards, as either normative or informative reference

Reciprocally, when applicable, they should give normative reference to component standards, for the components, which constitute the system.

In addition, the TCs with System function do not like to discover new classification, new designation and new coding as well as new requirements for their product in standards, which are not under their responsibility, and they expect that the terms they use, and the requirements, they set, are used identically by other committees.

NOTE 2: Similarly to note 1, TCs with System function are willing that TCs with Product function would refer to their systems standards when they exist without re-inventing other ones. Moreover, the TCs with Product function should not compete against the TCs with System function and use their work to counteract the decisions of TCs with System function.

For the users of the standards, the standards developer must provide congruity for all terms used in the different standards in its corpus of publications. When options exist with a Product Standard, and one or more option sets are defined as requirements in a System Standard, the System Standard may use a label for different option sets, but should clarify that these are selected options from within those defined by the Product Standard.

TCs with System function are expected to include rationale statements in their publications to facilitate take-up by TCs with Product function.

TCs with Product function are expected to include appropriate data and statements in their publication to facilitate take-up by TCs with System function.